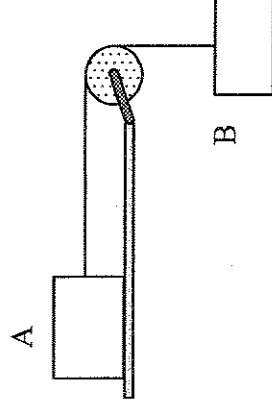
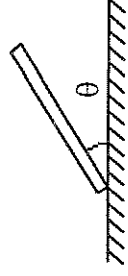


1. Two bodies are attached to each other by a rope passing over a frictionless pulley. When the body B is falling, it has an acceleration of $a_B = 2.3 \text{ m s}^{-2}$. What is the coefficient of kinetic friction between the body A and the plane, when the mass of body A is twice the mass of body B?



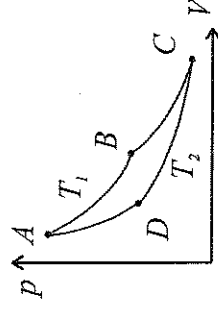
2. A straight homogeneous rod having a length of L is let go from the position shown in the figure. The rod is at rest in the beginning. Calculate the velocity of the rod when it hits the floor. The moment of inertia of the rod about an axis perpendicular to the rod and passing through the center of mass of the rod is $ML^2/12$, where M is the mass of the rod.



3. A rocket with a mass of 120 000 kg is standing on a platform on earth. The rate of the exhaust gases emerging from the rocket engines is 2 000 kg/s. What must the velocity of the exhaust gases be relative to the rocket for the rocket to have an acceleration of $a = g$ at the moment of launch $t = 0$?

4. A homogeneous cube is oscillating around its horizontal edge. Calculate the period of small oscillations. The edge has a length of a . The moment of inertia of the cube about an axis passing through the center of mass and parallel to the edge is $Ma^2/6$, where M is the mass of the cube.

5. Calculate the work done in each of the four processes of the Carnot cycle shown in the figure. The processes AB and CD are isothermal and the processes BC and DA are adiabatic.



6. The intensity level of a harmonic sound wave propagating in air is 30 dB. Calculate the maximum velocity of the air molecules relating to this sound wave. The sound levels are normalised to the reference level of $10^{-12} \text{ W m}^{-2}$, the density of air is 1.29 kg m^{-3} and the speed of sound in air is 340 m s^{-1} .

Write your name, student number, degree programme, code of the study module, and date of the exam in each paper.